

SOIL AND MOISTURE CONSERVATION IN COCONUT LANDS

Cover Crops and Mulching

COVER CROPS

One of the most effective methods for conserving soil and moisture in coconut lands is to establish a cover crop.

Usefulness of cover crop

- * Cover crops constitute the best primary control against surface run-off and the resulting erosion by breaking the impact of rain drops.
- * It provides a large quantity of mulch and thereby organic matter to the soil.
- * It improves the soil structure and infiltration of water, helping in moisture conservation.
- * It reduces leaching of nutrients, soil temperature and weed growth.
- * Leguminous cover crops provide nitrogen to the soil.

Cover crops are essentially surface feeders and generally do not compete for moisture with native deep-rooted plantation crops.

Characteristics of a suitable cover crop

- * It should grow quickly and cover the soil in a short period of time, thereby controlling weeds.
- * It should dry up during the drought period and should not compete for moisture. It should regenerate during rains and also produce seeds.
- * It should tolerate, shade and provide a large quantity of mulch.

Recommended Cover Crops

A cover crop should be selected after considering the climate of the area, soil conditions and the shade in the land. In the Wet zone areas under heavy rainfall (1,875 to 2,500 mm), cover crops are useful against soil erosion and adding fertility. In the Intermediate Zone (1,000-1,875 mm rainfall) and Dry Zone (less than 1,000 mm rainfall), cover crops should dry up during the dry months, adding large quantities of leaf litter and then regenerate with the onset of rains.

Creeping cover crops

For wet areas: (Wet and Wet Intermediate Zones)

1. *Pueraria phaseoloides* ('Pueero')
2. *Calopogonium mucunoides* ('Calopo')
3. *Centrosema pubescens* ('Centro')

For dry areas: (Dry Intermediate Zone and Dry Zone)

1. *Centrosema pubescens* ('Centro')
2. *Macroptilium atropurpureum* (Siratro)
3. *Pueraria phaseoloides* (for dry intermediate zone only)
4. *Calopogonium mucunoides* (for dry intermediate zone only)

Mucuna utilis ('Wanduru Me'), which covers the ground rapidly within 3-4 months is a good cover to plant in infertile soils for quick rehabilitation of land, particularly before replanting is done.

Bush cover crops

1. *Gliricidia sepium* / *Gliricidia maculata* (‘Wetamara’)

Gliricidia is suitable for any soil type and climate.

When the growers plan to establish cover crops, they should make the necessary arrangements, particularly ordering seeds, well in advance.

Some notes on the recommended cover crops are given below:

Pueraria phaseoloides (‘Phero’) [Earlier called *Pueraria javanica*] (Fig. 1 a) This is a climbing or creeping perennial, spreading by long vigorous runners and rooting at nodes to provide a deep, smothering mat. Leaves have three large round and hairy leaflets; flowers with colour varying from blue to pale bluish purple; seed pods cylindrical; pods mature irregularly; seeds small, oblong, dark brown and susceptible to insect attack and sometimes show poor germination. About 80,000 seeds per kg.

This cover crop can be grown in a wide range of soils. Although it does not thrive well on sandy soils, it is particularly useful for clay and gravelly soils. It can withstand water-logging and moderate shading.

This species can be established from cuttings or seeds. It grows moderately rapidly and forms a dense thick cover in 9 to 12 months. It dies back during drought, but recovers after a few showers. It cannot tolerate heavy grazing or cutting.

Calopogonium mucunoides (‘Calopo’) [Fig. 1 b] This is a climbing or creeping perennial which in general resembles Phero. Roots at nodes, flowers small and blue; pods brown and narrow covered with fine brown hairs; seeds flattened, squarish and light brown. There are about 70,000 seeds per kg.

This species can be established by seeds or cuttings. It thrives on a wide range of soils and forms a thick cover in six to eight months. It can also tolerate shade to a great extent. It dies back during drought, but regenerates quickly after the rains. Frequent droughts can however kill the cover crop. Not very palatable for livestock. Can be grown alone or in mixture with Phero and Centro.

Centrosema pubescens (‘Centro’) [Fig. 1] This is a climbing perennial with long stems often rooting at the nodes; leaves small with three ovate leaflets with pointed tips. Flowers are mauve; pods dark brown, long, narrow with a sharp tip. Seeds are large, somewhat flat, hard and dark brown in colour. There are about 40,000 seeds per kg.

It can thrive well on a wide range of soils. Growth during early stages is slow and generally slower than Calopo and Phero. Can tolerate poorly drained conditions. Seeds are used for establishment.

Although mature *Centrosema* can tolerate shade, growth of seedlings will be slow. Although it is a very hardy plant which does not completely die back during dry season, it accumulates large amounts of leaf litter. If die-back does occur, recovery after rains is very rapid.

This species is relished by cattle and can withstand heavy grazing. Suitable to grow in cover crop mixture with more rapid-growing Phero and Calopo and also with pasture grasses.

Macroptilium atropurpureum (Siratro) [Fig. 1 d]: This species has underground stems, roots at the nodes. Leaves have three broad leaflets, characteristically lobed and green on the upper surface and covered with silvery gray hairs on the lower surface. Flowers deep purple; pods narrow, straight and cylindrical, carry about 12 seeds shattering at maturity; seeds dark brown and contain about 80,000 per kg. Ability to seed freely aids its spread.

Although it thrives on a wide range of soils, Siratro prefers light-textured soils. Because of its relatively deep tap root, it can tolerate drought and thrives in low rainfall areas and accumulates considerable amounts of leaf litter. It performs well under moderate shading and is relished by cattle. Suitable to grow in cover mixed and with pasture grasses.

Gliricidia This is a fast-growing, medium-sized leguminous tree. There are two distinct species, namely *Gliricidia sepium*, which produces purple coloured flowers and large round seeds (about 5,000/kg) and *Gliricidia maculata*, which produces white-coloured flowers and small round seeds. Of these, *G. sepium* is more common.

It grows rapidly producing a large quantity of foliage which can be used as a green manure. The leaves decompose relatively fast, providing nitrogen potassium etc. After lopping, re-growth of gliricidia is rapid enabling quick recycling of minerals. This species, which can be propagated by cuttings and seeds, grows well in low-fertile soils and can tolerate drought. Gliricidia is also a useful source of fuel wood, fodder, poles etc..

Planting and management of creeping covers

Cover crop seeds can be bought from seed merchants. Alternatively, seeds can be collected from existing cover crops.

Seeds: Most of the cover crops flower in October/November and mature pods of straw-brown colour can be harvested around January/March. Once the pods are ready for harvesting, they can be picked every other week. Each pod contains around 8-12 seeds. After harvesting, the pods should be sun-dried for 2-3 days. The pods are then covered with a mat and sampled to obtain the seeds. Good seeds can be separated by winnowing.

Land preparation: The land should be free of weeds to facilitate rapid establishment of the cover crop. The land should first be ploughed and then disc-harrowed across the ploughed rows to remove weeds. The disc-harrowed surface should be levelled with mamoty forks and hand rakes. When cover crops are planted for the first time and particularly in poor sand soils on eroded slopes, it is recommended that after application of a small amount of cattle manure or a small dose of artificial fertilizer such as a mixture of 1/2 kg urea, 1-2 kg of phosphosphate and 1 kg of muriate of potash per coconut square be given.

Planting: It is always advisable to establish cover crops with the south-west monsoon rains (May/June), preferably at the beginning of rains. Normally seeds are harvested around March. Before sowing, the seeds should be dipped in water for 3 minutes followed by soaking in water for 12-24 hours. Seeds so treated should not be allowed to fully dry before sowing. After sowing, seeds should be covered by a light harrow with mamoty forks, hand rakes or by a heavy harrow.

Seeds can be broadcast in rows 60 cm apart, which would require about 5-6 kg seeds/ha. Seeds could also be broadcast in the entire area (leaving the manure circle) and this would require 8-10 kg seeds/ha. If planted in rows, it is possible to weed between rows.

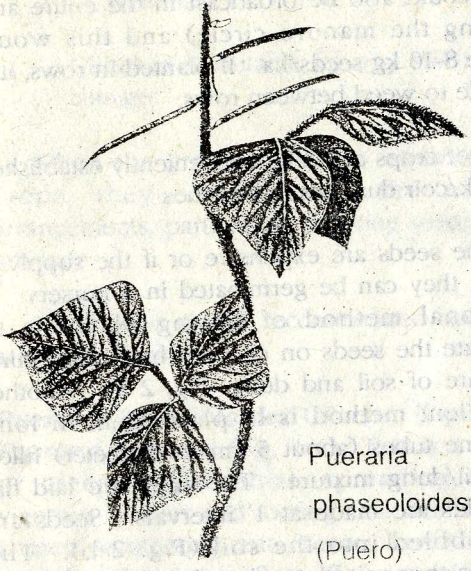
Cover crops could be conveniently established on husk/coir dust pits or trenches.

If the seeds are expensive or if the supply is limited, they can be germinated in a nursery. A traditional method of raising plants is to germinate the seeds on coconut husk containing a mixture of soil and dung (Fig. 2 a). Another convenient method is to plant them in long polythene tubes (about 5 cm in diameter) filled with soil/dung mixture. The tubes are laid flat and holes are made at 1' intervals. Seeds are then dibbled into the soil (Fig. 2 b). The seedlings thus raised can be planted in the field at regular intervals (say 1 meter apart or in 3-4 patches/coconut square).

Some cover crops could also be propagated by cuttings with adventitious roots.

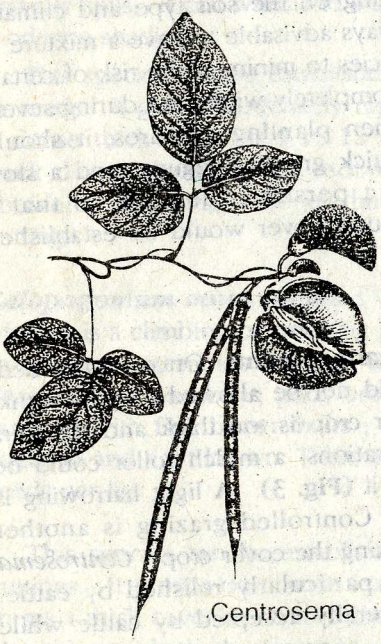
Cover crop species may be planted alone or mixed depending on the soil type and climatic zone. It is always advisable to have a mixture of cover crop species to minimize the risk of certain covers being completely wiped out during severe droughts. When planting mixtures, it should consist of a quick growing legume and a slow growing, but a persistent legume so that a permanent ground cover would be established later.

Cover crop management: Once established, the cover should not be allowed to grow rank. When the cover crop is too thick and hampers other field operations, a mulch roller could be used to control it (Fig. 3). A light harrowing is also possible. Controlled grazing is another method of checking the cover crop. *Centrosema* and *Siratro* are particularly relished by cattle. *Pueraria* is generally accepted by cattle while *Calopogonium* seems to be less favoured. Buffaloes eat all the species. Heavy grazing by cattle should be avoided or else the covers may fail to recover.



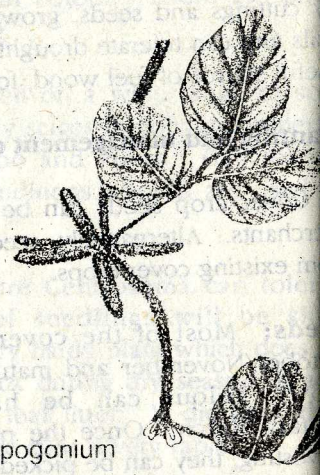
Pueraria
phaseoloides
(Puer)

Fig. 1a



Centrosema
pubescens
(Centro)

Fig. 1c



Calopogonium
mucunoides
(Calopo)

Fig. 1b



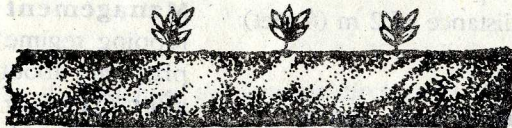
Macroptilium
atropurpureum
(Siratro)

Fig. 1d

Fig 2. - Germination of cover crop seeds



a. On coconut husk with soil and dung mixture



b. In polythene tube filled with soil/dung mixture

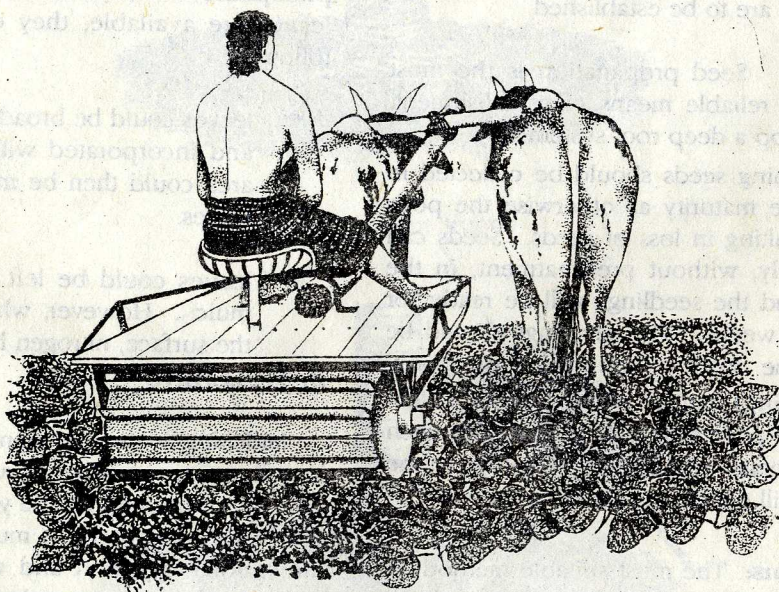


Fig. 3 - A simple mulch roller drawn by draught animals
for the control creeping cover crops

When treating the cover crops, it is recommended that alternate rows and not the entire field be treated, because if adverse weather conditions follow the treatments and the cover fails to regenerate in the treated rows, the untreated portions can spread over in to the adjacent rows. On hilly lands the rows treated should be in the contour.

The cover crop could be allowed to grow within the manure circle in adult palms. When it is grown in young coconut plantations it is essential that the cover crop in the area round the young palms up to a distance of 2 m (6 feet) is kept in check.

Planting and Management of bush covers

1. *Gliricidia* can be planted from stakes or from seeds.

Stake planting Mature cuttings should be taken from stems at least one year old. For live fences, shade trees and poles, cuttings of 1.5 m height and 2.5-3.0 cm diameter can be planted. The cuttings develop a shallow, laterally-spread root system. Although establishment by cuttings is convenient, it is suitable mainly for situations where few trees are to be established.

Seed planting Seed propagation is the most convenient and reliable means of establishment. Seedlings develop a deep root system.

Pods containing seeds should be collected in April just before maturity as otherwise the pods will shatter resulting in loss of seeds. Seeds can be sown directly, without pre-treatment, in the nursery bed, and the seedlings will be ready for planting in 4-6 weeks. The seedlings should be planted with the onset of south-west monsoon. Normally, seedlings can be planted about 15 cm (6 in.) deep. In poor soils, addition of 30 g each of muriate of potash and saphosphosphate to the planting hole will encourage seedling growth.

Planting systems: The most suitable method of planting *gliricidia* in coconut plantations is along

the boundaries as double rows 60 cm (2 feet) apart with inter-row spacing of 60 cm in triangular system. In the Intermediate Zone and Dry Zone, where alley cropping with short-term food crops can be undertaken, *gliricidia* can be planted in double rows 3-4 m apart with 0.5 m within row spacing in the coconut avenue. On any neglected or eroded land where a cash crop cannot be grown, *gliricidia* can be planted as a green manure crop in double rows, 1-2 m apart with 0.5 m within row spacing in the coconut avenue.

Management of *gliricidia*: A systematic lopping regime should be adopted. When plants are about 1.5 m height (about 9-12 months after planting) the first cutting can be done. Foliage production can be optimized by harvesting once every three months. For green manure, harvesting can be done at six-month intervals. Lopping can be done either around 100 cm height above the ground in cropping systems or 1-2 m above ground in live fences and shade trees.

Gliricidia leaves can be used as a green manure. About 30 kg of leaves will provide sufficient nitrogen and a part of potash and phosphate for coconut. Whenever *gliricidia* leaves are available, they could be applied as follows:

- * leaves could be broadcast around the plantation and incorporated with a mamoty. The area could then be mulched with coconut leaves.
- * leaves could be left on the surface as a mulch. However, when leaves are left on the surface, nitrogen loss is appreciable.

B. MULCHING

Mulching is an important agricultural practice in soil and moisture conservation, and should be carried out throughout the year to ensure that soil is never exposed. A mulch protects soil from direct solar radiation and wind effects, reduces soil water loss and controls weed growth.

A mulch also reduces erosion by breaking the impact of rain drops. In sloping lands, this aspect of utmost importance.

Vegetable matter is used as a layer in mulching. A variety of materials is available.

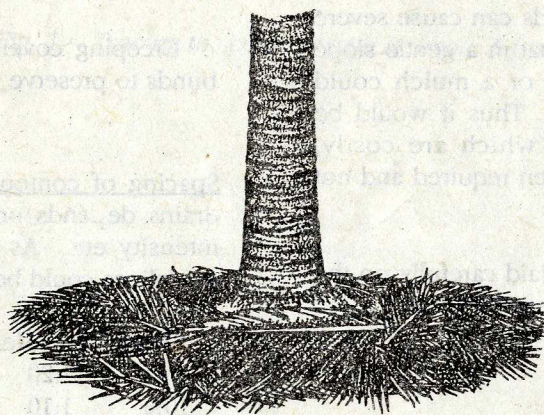
* One of the most common practices is to use husks as a mulch. One layer of husks is placed with the outer side facing upwards upto a distance of about 2 m

from the base of the palms.

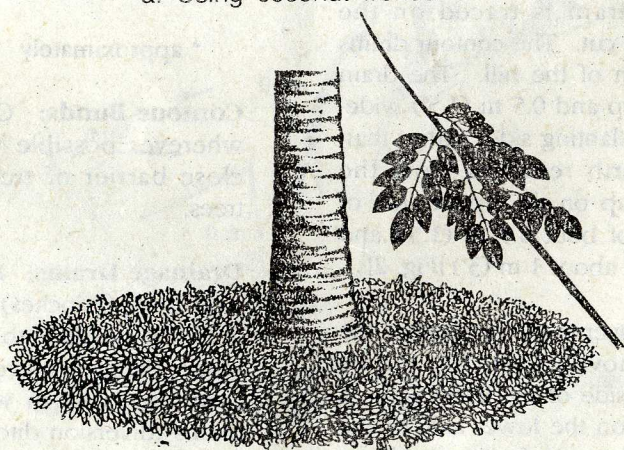
* Other materials which can be used are coconut fronds, straw, weed trash, cover crop loppings and loppings from other plants. (Fig. 4 a & b).

Any undecomposed thick mulch should be removed before broadcasting fertilizer. It is important to re-introduce the mulch after fertilizer application.

Fig. 4 - Mulching the manure circle area
(2 meters from the base of the palm)



a. Using coconut fronds



b. Using gliricidia leaves